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(54) Title: **MEDIATED ELECTROCHEMICAL OXIDATION USED FOR THE DESTRUCTION OF ORGANICS CONTAMINATED WITH RADIOACTIVE MATERIALS, DISSOLUTION OF TRANSURANICS, AND THE DECONTAMINATION OF EQUIPMENT CONTAMINATED WITH MIXED WASTE**

(57) Abstract: A mixed waste mediated electrochemical oxidation process (MEO) process and apparatus for the dissolution of transuranic elements (e.g., plutonium, neptunium, americium, curium, and californium), and/or compounds thereof in transuranic waste (TRUW), low level waste (LLW), low level mixed waste (LLMW), special case waste (SCW), and greater than class C (GTCC) LLW's, and also the destruction of the non-fluorocarbon (e.g., PTFE) organic component in the waste. The MEO process and apparatus operates in three different modes; dissolution, destruction, and decontamination. Non-radioactive materials combined in the waste are part of the mixed waste. The principle components of mixed waste of concern are the organic materials that are contaminated with radioactive compounds. In the first mode, dissolution, the process runs until the transuranics such as a mixed oxide or carbide, and/or mixture of oxides or carbides of uranium and plutonium are totally dissolved into solution. The second mode destruction, the process is operated such that the mixed waste materials are reduced to a CO<sub>2</sub>, water and small amounts of inorganic salts. The third mode decontamination, involves contaminated equipment, instruments, glassware, containers (drums and equipment). In the decontamination mode the MEO process destroys the mixed wastes that have contaminated the equipment. In the mediated electrochemical oxidation process one or more regenerable oxidizing redox couples (specified in Tables I and II) interact with the mixed waste to decompose it. The oxidizers are present in electrolytic solutions that are acidic, alkaline, or neutral, operating in the temperature range of slightly above freezing to slightly below boiling point of the electrolyte at one atmosphere.



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## INTERNATIONAL SEARCH REPORT

International application No.

PCT/US03/23491

**A. CLASSIFICATION OF SUBJECT MATTER**

IPC(7) : A62D 3/00; C25F 1/00; C02F 1/46

US CL : 588/204, 210, 227, 237, 247; 204/263; 205/687, 688, 701, 703, 746, 766, 770

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 588/204, 210, 227, 237, 247; 204/263; 205/687, 688, 701, 703, 746, 766, 770

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5,952,542 A (STEELE) 14 September 1999 (14.09.1999), columns 2-3	1-2, 4-15, 18-19, 23-26, 30-34, 36-37, 40-47, 49-50, 52-56, 58-63, 65-70, 77, 82-83, 85
X	US 5,911,868 A (BALAZS et al.) 15 June 1999 (15.06.1999), columns 3-5	1-2, 4-10, 13-15, 17-20, 22-26, 28-31, 33-44, 46-49, 52-59, 61-63, 65-70, 72-73, 77-78, 83
X	US 5,756,874 A (STEWART) 26 May 1998 (26.05.1998), columns 7-9	49-50, 52-56, 58-63, 65-70, 77-78, 82-83, 85



Further documents are listed in the continuation of Box C.



See patent family annex.

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## INTERNATIONAL SEARCH REPORT

## C. (Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5,855,763 A (CONLIN et al.) 5 January 1999 (05.01.1999), columns 3-7	1-2, 4-10, 13-19, 23-26, 30-31, 33-34, 36-37, 40-47, 49-56, 58-63, 65-70, 77, 82-85
X	US 5,968,337 A (SURMA et al.) 19 October 1999 (19.10.1999), columns 3-5	1-2, 4-10, 13-15, 17-20, 23-26, 28-31, 33-50, 52-70, 72-73, 77, 79-83, 85